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CALIFORNIA, MEXICO

BY

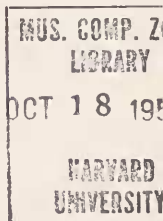
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SAN DIEGO, CALIFORNIA

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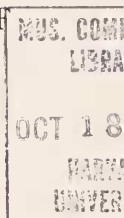
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SNAKES OF THE ISLANDS IN THE GULF OF CALIFORNIA, MEXICO

BY

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In connection with a general study of the herpetofauna and zoogeography of the islands in the Gulf of California, several new species and unrecorded occurrences of snakes have come to light. As an aid to other workers, it seems advisable to present the new data in advance of the larger work, and to integrate these data in a revised synopsis of the snakes of the islands.

Much new material has been collected on the islands and deposited in the Stanford Natural History Museum through the generosity of Mr. Joseph W. Sefton, Jr., and the Sefton Foundation of San Diego, California. The Foundation's fine research ship *Orca* was made available to a group of biologists, primarily from Stanford University, for two successive spring trips in the Gulf. The 1952 trip lasted three months and the 1953 trip six weeks. Previous to the *Orca* expeditions, only two major expeditions had visited the islands, that of the United States Bureau of Fisheries Steamer *Albatross* in 1911 and that of the California Academy of Sciences expedition in 1921. Subsequent to these two expeditions, few specimens have been taken from the islands, largely the result of incidental collecting by persons engaged in other work.

Twenty-nine species and subspecies of snakes are now known to occur on the islands (see Table 1). Twelve of the 29 species and subspecies, or about 40 per cent, are endemic to single islands.

In studies of island populations, the question of what constitutes a species and what constitutes a subspecies is immediately raised. Obviously, there is no completely free exchange of genes or interbreeding between populations on the islands and the mainland, or between different islands. Inasmuch as no experimental work has been done, the only criterion for specific or subspecific recognition that can be used in these instances is the degree and constancy of morphological differences between populations. If the island population is widely different from that encountered on the mainland or adjacent islands and is consistent in these differences, the insular population is best termed a species. However, if the island population is only slightly different and its differential characteristics not entirely constant, it is best known as a subspecies.

The plant associations on the islands are quite similar to those found on the adjacent mainland. The flora of the islands has been indicated as only two per cent endemic (Johnston, 1924). Collecting on the islands is quite different from collecting on the mainland, because, on the islands, the reptiles occur in much greater densities. This is especially true of the lizards. The vegetation of most of the islands is denser than that of the mainland. This ecological factor may be the cause of the higher density of the reptile population.

More collecting on the islands will undoubtedly disclose new records and possibly new species of snakes. *Crotalus* and *Hypsiglena* probably occur on all of the larger islands. Burrowing and nocturnal snakes are also to be expected, especially representatives of the genera *Leptotyphlops*,

Lampropeltis, *Chilomeniscus*, and *Sonora*. It is strange that no *Pituophis* has been taken on any of the islands.

In the text and on the map (fig. 1), the islands are assigned the most generally accepted names. Two islands in the Gulf of California are called Partida. The southern Partida lies just to the north of Espíritu Santo Island and at low tide is separated from it by a water gap of only ten feet. These islands are a biological unit and are included in this report as such, under the name of the larger island, Espíritu Santo. The northern Partida (Partida del Norte) lies between Angel de la Guarda Island and Raza Island. San José Island is sometimes written as San Josef, but the former name is now generally accepted. Cerralvo Island appears as Ceralbo or Ceralvo on some maps, but the majority of modern maps now designate the island as Cerravlo.

The small islands north of San Luis Bay are named San Luis Island (or Islands) on many published charts and other maps, but locally, the name Isla San Luis is applied to the island in San Luis Gonzaga Bay, and that seems to be the correct usage. The islands north of the bay are variously named. The group as a whole is known locally as Islas Las Encantadas, though some persons recognize as a "correct name" Islas Salvatierra. The largest and southernmost, to which the name San Luis has been wrongly applied, is more properly known as Isla Encantada Grande. Just northwest is a much smaller islet, Isla Poma. Ten miles northwest of Encantada Grande lies Isla El Muerto, the only island on which snakes have been found. Between Encantada Grande and El Muerto are Isla Choyudo (or Cholludo) and Isla Coloradito. Northwest of El Muerto, and very close to the mainland shore, is the smallest island of the group, Isla Huérfanito. These names seem to be in universal local use, though they conflict with names applied on the few maps that assign any name other than San Luis to any of these islands. The conflicting names applied to these islands are discussed by Klauber (1949, p. 96). He lists, in addition to the islands mentioned here, an island between Encantada Grande and El Muerto. Dr. Carl L. Hubbs, Scripps Institution of Oceanography, who has supplied data on the proper names of these islands, informs me that there is no island between La Encantada and Pomo and consequently there are only six islands in the group, rather than seven as listed by Klauber.

Abbreviations have been used to designate the museums where specimens are deposited, as follows: SU, Natural History Museum, Stanford University; CAS, California Academy of Sciences; LMK, private collection of L. M. Klauber; MVZ, Museum of Vertebrate Zoology at the University of California, Berkeley; MCZ, Museum of Comparative Zoology at Harvard University; USNM, United States National Museum.

Lichanura roseofusca gracia Klauber, 1931

A single dried example of this subspecies is known from Mejía Island. This single example (CAS 50804) was found under a rock by J. R. Slevin on June 28, 1921.

Scale counts are impossible to make with certainty because of the dried and brittle condition of the specimen. Ventral and caudal counts are likewise impossible to ascertain, since the snake is broken into several pieces and portions are missing. I am assigning this specimen to the subspecies *gracia* because the longitudinal stripe is present, it has even edges, and it is red brown. On geographical grounds, also, this subspecies

would be expected on a northern island, as it occurs on the adjacent mainland of Baja California.

Chilomeniscus cinctus Cope, 1861

A single male (SU 14035) referable to this species was collected on San José Island near Punta Salina on April 11, 1952. It constitutes a new insular record.

It is a young specimen only 152 mm. from snout to vent, tail length 27 mm. Ventrals number 109, caudals 25, supralabials 7, and infralabials 8.

The head scales are typical of mainland examples of the species and consist of: a rostral twice as wide as high, paired nasal-internasals which are separated medially by the posterior apex of the rostral, paired prefrontals which are in contact medially, and a shield-shaped frontal which is bordered by 2 parietals posteriorly. On either side there is 1 preocular, 2 postoculars and no loreal. The third and fourth supralabials contact the eye.

In coloration, this example is similar to the endemic species from Espíritu Santo Island, *Chilomeniscus punctatissimus*. The 32 brown bands are slightly wider than the interspaces. The interspaces contain a series of dots; these dots are about half a dorsal scale in size and are of the same color as the bands. The head scales anterior to the first body band are gray-olive and are suffused with light brown. None of the bands encircle the body; the majority barely touch the ventrals. Five of the bands are on the tail. However, in both squamation and coloration, this example falls well within the limits of variation for *C. cinctus*.

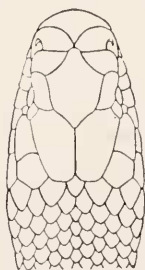


Figure 2. Outline Drawing of the Head of *Chilomeniscus savagei*. Holotype (SU 14034).

Holotype (SU 14034). Collected under debris on the sand dunes on the southwest coast of Cerralvo Island by Jay M. Savage, April 3, 1952. The snake is named for the collector whose numerous suggestions and thorough knowledge of the reptile and amphibian fauna of Baja California have aided me on numerous occasions.

Diagnosis: This distinctive insular species differs from all other species of the genus in having a higher number of ventrals and unique color pattern, and from all species except *C. punctatissimus* from Espíritu Santo (Partida portion), in having the prefrontal reduced in size and the frontal contacting the fused nasal-internasal.

Description of type: A mature female, 234 mm. in length from snout to anus, length of tail 34 mm., head length 10.3 mm., head width 6.0

mm., greatest width of body 8.0 mm., greatest eye diameter, 1.1 mm.

Head not distinct from body; short tail tapering to a point. The upper jaw protrudes and the rostral is prominent. The pupil is round. The scales are smooth, with no apical pits; they are arranged in 15-13-13 rows, with 6 scale rows at the middle of the tail length. The ventrals number 134 and the paired caudals 27. The anal plate is divided. There are 7-7 supralabials and 8-8 infralabials. The supralabials increase in size posteriorly; the last is the largest; the third and fourth contact the eye.

The rostral is about twice as wide as high and extends posteriorly to a blunt angle partly separating the nasal-internasal. The inferior surface of the rostral has a central depression near its posterior margin.

The scales on the crown comprise paired nasal-internasals, paired prefrontals, paired supraoculars, paired parietals, and a single median frontal. The nasal-internasals meet medially and meet the first supralabial, prefrontal, and rostral broadly; they barely touch the second supralabial. The valvular nostril is pierced near the lateral edge of the nasal-internasal. The prefrontals are widely separated medially by the forward extension of the frontal and also meet the preocular, supraocular, second supralabial, and nasal-internasal. The frontal is shield-shaped and is bordered posteriorly by the 2 large parietals. There are two postoculars, the upper of which is the larger. The temporals are 1-2. There is no loreal.

There are two pairs of chin shields. The anterior comes to a point medially, the posterior to a point laterally. The anterior is slightly larger. The first supralabial extends laterally to separate the mental completely from the chin shield. The anterior chin shield is bordered laterally by the first three infralabials. Four scales separate the posterior chin shields from the most anterior ventral.

Coloration: The very simple pattern consists of 29 body rings of a light brown color about 3 scale rows wide. The light interspaces are narrower, about 2 scale rows wide. The most anterior dark ring extends from the edge of the second preocular on each side to the posterior edge of the parietals. The posteriormost ring surrounds the end of the tail. The dark body rings are continued onto the ventral surface, where all but a few of the anterior merge into one another. Five of the rings are on the tail. In life, there is a pinkish-orange suffusion in the flesh-white interspaces, which includes the vertebral scale row in addition to from 2 to 3½ scales on each side. This suffusion is bleached out in preservative. The snout is white. In life, the venter between the brown rings is a delicate pink, but in the preserved state this color disappears and the venter is an immaculate flesh color. The throat is slightly suffused with brown. The rostral, nasal-internasal and anterior portions of the prefrontals and frontal are white in life, but turn yellowish in preservative.

The paratype (SU 16062) is an adult female with an incomplete tail, collected by John P. Figg-Hoblyn in the sand dunes near the place where the holotype was collected, on Cerralvo Island, but a year later, on March 20, 1953. The paratype has 136 ventrals, 7 supralabials, 8 infralabials and has the same details of head squamation as the type. It differs in that none of the body blotches encircle the body. Most, however, extend onto the ventrals. The first and only blotch on the tail completely encircles it.

Relationships: In color pattern, this insular species resembles *Chilomeniscus cinctus* from Arizona, Sonora, and the mid-peninsula region of Baja California. It shares its distinctive arrangement of head scales only with the species from Espíritu Santo Island. In addition, the Cerralvo specimens have a higher number of ventrals than any other species. It is problematical whether the two species on Cerralvo and Espíritu Santo islands are insular relics of an older stock of *Chilomeniscus*, or whether the evolution of these species has been effected solely through isolation in an insular environment. It does seem evident, however, that the two insular species are closely related and, since Cerralvo harbors many distinctive species, it would appear likely that Espíritu Santo Island has derived its species of *Chilomeniscus* from Cerralvo.

Chilomeniscus punctatissimus Van Denburgh and Slevin, 1921

This insular species, based on only one specimen from Partida, Espíritu Santo Island, was placed in the synonymy of *Chilomeniscus cinctus* by Smith (1945, p. 34). Inspection of the type and comparison with mainland and insular examples of the genus warrant the specific recognition of this single example.

The holotype of the species is CAS 49516, an adult female collected on Isla Partida by Chamberlin, May 31, 1921.

The most important characters separating this species from *C. cinctus* lie in the arrangement of the scales on top of the head. As in *Chilomeniscus savagei*, the prefrontals are reduced in size, allowing the frontal to meet the fused nasal-internasal. On each side, a small scale is interposed laterally to the prefrontal and above the first supraocular, which forms the posterior border of the nasal opening, but I believe this to be of very little taxonomic importance.

Van Denburgh and Slevin recognized this species primarily on the basis of the spotting that occurs on the light interspaces between the body blotches—a character of little importance in this genus, as pointed out by Linsdale (1932, p. 382).

A brief redescription of the species seems desirable, with particular emphasis on head squamation. The scales on the top of the head comprise paired nasal-internasals, prefrontals and supraoculars, a single rostral, and a frontal. The rostral is about twice as wide as high and extends far enough posteriorly almost to interrupt the contact of the internasals. The prefrontals are prevented from touching one another medially by the forward extension of the frontal, which extends anteriorly to meet the internasal. The small single preocular touches the small postnasal; there is no loreal. There are 2 postoculars. The supralabials number 7–7, the infralabials 8–8. The third and fourth supralabials border the eye. The dorsal body scales are in 13 rows; they are smooth with no apical pits. The anal plate is divided. There are 120 ventrals and 23 caudals.

Coloration: There are 39 dark brown bands on the body, including both the band on the head that extends from the anterior margin of the eye to the middle of the last supralabial and the dark tip of the tail. The interspaces are slightly wider than the bands. Within the light interspaces there are from 10 to 15 light tan spots which may occur on any of the dorsal scale rows except the 2 lateral rows on each side. The spots are

most intense near the vertebral scale row and are about half as large as the dorsal scales.

Relationships: As discussed under *C. savagei*, this species is considered to be closely related to the Cerralvo species and possibly derived from it.

Hypsiglena torquata gularis Tanner, 1954

The two females of this genus from Partida Island have recently been considered to represent a distinct insular subspecies. The type is CAS 51009, and the paratype 51010. Ventrals number 185-183, caudals 43-43, scale rows at midbody 17-19, and body blotches 68-68.

This subspecies is most closely related to *H. t. venusta* of the mid-peninsula, from which it is said to differ in having larger dorsal blotches, one or more pairs of enlarged gulars, fewer caudals, and a proportionately shorter tail.

Hypsiglena torquata ochrorhyncha Cope, 1860

This subspecies, which occurs in the Cape region of Baja California, is found on San José Island. Four specimens are known from this island: CAS 57398 and 57392, and LMK 3816 and 3815. The first three are males. Ventrals number 176-178-168-176,¹ caudals 46-50-50-47, scale rows at midbody 17-17-17-17 and body blotches 52-50-65-66.

This subspecies is distinguished from *H. t. venusta* in having fewer and correspondingly larger dorsal blotches and in having fewer ventral and caudal plates. The body blotches are undivided dorsally, and there is no median light stripe.

Examination of more specimens of this subspecies will probably lead to the distinguishing of a Cape subspecies from the populations in Arizona and Sonora. A trend is evident in ventral counts, but no characters that would justify nomenclatorial separation have as yet been discovered.

¹Counts listed in same order as register numbers of the specimens.

Hypsiglena torquata tortugaensis W. Tanner, 1944

This subspecies is known from only two male specimens from Tortuga Island. The type is CAS 51460 and paratype LMK 4074.

The insular subspecies may be separated from the mainland forms, *ochrorhyncha* and *venusta*, by a higher number of ventrals and caudals, as shown in the following table:

	Male ventrals	Male caudals
<i>ochrorhyncha</i>	166-188	46-66
<i>venusta</i>	176-184	54-56
<i>tortugaensis</i>	187-190	57-59

The other distinguishing characteristics of this insular subspecies are an elongate narrow median stripe on the neck and divided lateral neck stripes.

Tanner (1944, p. 70) believes that this insular subspecies is more closely related to *venusta* than to *ochrorhyncha*.

Hypsiglena torquata venusta Mocquard, 1899

The mid-peninsula subspecies of *Hypsiglena* is known from the following Gulf of California islands: Carmen, San Marcos, San Esteban,

and San Francisco. The specimens from the last two islands constitute new insular records.

This subspecies is distinguished from *ochrorhyncha* in having a higher number of dorsal blotches, in having these blotches of small size, and in having the blotches alternating or divided to produce two rows instead of one, with a resultant light median dorsal stripe narrower than one scale in width.

The single female from San Esteban Island (SU 16066) has 179 ventrals, 29 caudals (tail incomplete), 21 scale rows at midbody, and 74 body blotches. On the posterior quarter of the body, the blotches coalesce.

The two females from San Francisco Island (SU 16067 and 14039) have 183–180 ventrals, 46–44 caudals, 21–21 scale rows at midbody, and 76–81 body blotches.

There are also two females from Carmen Island (CAS 51814, and MCZ 31583). The counts are as follows: ventrals 174–182, caudals 50–51, 19–19 scale rows at midbody, and 95–95 body blotches.

The male from San Marcos (CAS 51462) has 184 ventrals, 54 caudals, 19 scale rows at midbody, and 74 body blotches.

Lampropeltis catalinensis Van Denburgh and Slevin, 1921

This beautiful and distinctive insular species is known from a single adult male (CAS 50514) which was dug from the center of a decaying cactus stump on Santa Catalina Island. Although a thorough search for this species was made on both the occasions on which the author was on this island, no additional specimens were collected. A shed skin was found near a small spring which may have been from a *Lampropeltis*, but no live animals were seen or captured.

Since Van Denburgh (1922, p. 769) has presented a detailed account, only a short description will be presented here.

Ventrals number 228, divided caudals 63, scale rows at midbody 23, supralabials 8, infralabials 9. Color and color pattern are the distinguishing peculiarities. A purple longitudinal dorsal band, about 5 scale rows wide, extends from the head to the end of the tail. Along this mid-dorsal line, at intervals of 3 to 4 scales, are light yellow spots on a single scale. The lateral dorsal scales are purple with light yellow centers. The head above has the same color as the dorsal band and is marked with light yellow suffusions on the crown and sides. The ventrals and caudals are black, with extensive white marbling in an irregular pattern. The under surface of the head is light yellow, with the chin shields, gulars, and first several ventrals edged with black or purple.

The only other *Lampropeltis* with a color pattern near that of *catalinensis* is *L. nitida* from the Cape region of Baja California, which has a poorly defined light mid-dorsal stripe, no uniform spotting laterally, and the ventral surface uniformly stippled with brown. Van Denburgh (*loc. cit.*) states that the snake was canary yellow, purple, and black before preservation.

Masticophis barbouri (Van Denburgh and Slevin), 1921

The second and third examples of this insular species were collected on Espiritu Santo Island. SU 14040 was collected by John P. Figg-Hoblyn on April 5, 1952. It is an adult male, 872 mm. from snout to tip of tail,

head length 24 mm., tail length 176 mm. (incomplete). The dorsal scale row formula is 19-17-13. There are 194 ventrals and 68 caudals (incomplete). There are 8 supralabials and 9 infralabials. SU 16068 was collected by Figg-Hoblyn on March 23, 1953. It is also an adult male, 701 mm. from snout to tip of tail, head length 21 mm., tail length 226 mm. The dorsal scale row formula is 19-17-13. There are 195 ventrals, 141 caudals (tail presumably complete), 8 supralabials, and 9 infralabials.

In details of coloration, these specimens agree closely with the type, which is an adult female larger than either of the two recently acquired specimens. The color above is a uniform olive-brown extending onto the ventrals. Along each side, a single white stripe is located on the medial half of the fourth scale row and on the lateral half of the third scale row, and fades out at the anal plate. This stripe is edged narrowly with black. Anteriorly, this stripe is dilated at intervals of 4 or more scales. The sides of the head are spotted with white; there are two spots posterior to the eye, and a white line extends anteriorly from the eye to the tip of the snout. The upper quarter of the supralabials is blackish-brown. The remainder of the supralabials and the infralabials, chin, and neck are white, lightly flecked with darker spots, which appear blue under the microscope. The anteriormost ventrals are suffused with salmon and bear a few spots of blue. The remainder of the ventral surface is an immaculate white.

This species is closely related to *Masticophis lateralis* and also to *M. aurigulus*, but I disagree with Ortenburger (1928, p. 68), who assumes it to be an annectant between *lateralis* and *aurigulus*. I consider it to be a distinct species derived from *lateralis* by isolation in an insular environment.

Masticophis bilineatus Jan, 1863

This species, previously unknown from the Gulf of California, was found on two islands, Tiburón and San Esteban.

Hensley (1940, p. 272) described a subspecies, *Masticophis bilineatus lineolatus*, from 4 specimens collected in the north branch of Alamo Canyon, Ajo Mountains, 12.9 miles south and 5 miles east of the Ajo-Tucson-Sonoyta Junction in Organ Pipe Cactus National Monument, Pima County, Arizona, May 23, 1949. He used four characteristics to differentiate his race from the common Arizona form:

Masticophis bilineatus bilineatus: (1) Dorsolateral light stripe comprises the upper half of the third and lower half of the fourth scale row. (2) Dorsolateral light stripe originates on fourth scale row posterior to last supralabial. (3) Chin spotting is very light or usually not evident. (4) The pattern of dots on the edge of the ventrals is not evident enough to warrant calling them a definite stripe.

M. b. lineolatus: (1) Dorsolateral light stripe is narrower, comprising only the upper quarter of third scale row and lower quarter of fourth scale row. (2) Dorsolateral light line originates 7.75 scale rows posterior to the last supralabial. (3) Chin spotting is pronounced and blotches occur in the neck region and on the anterior portion of the ventrals. (4) There is a definite dark stripe on the lateral edges of the ventrals.

The four examples from Isla San Esteban (SU 14041-43 and 16069) and Tiburón (SU 14044) are like Hensley's subspecies in these four characteristics. An examination shows coastal Sonora material to be intermediate in these characteristics. I hesitate to refer these insular examples to Hensley's subspecies until further specimens are collected and a more substantial geographical distribution pattern is outlined.

Data on the insular specimens examined are as follows:

San Esteban:

14041 (male)	208	ventrals,	139	caudals,	dorsolateral line originates on 7th scale posterior to last supralabial.
14042 (female)	204	"	137	"	. . . on 7th scale
14043 (female)	206	"	142	"	. . . on 6th scale
16069 (female)	197	"	incomplete		. . . on 6th scale

Tiburón:

14044 (male)	206	"	139	"	. . . on 7th scale
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Masticophis flagellum piceus (Cope), 1892

This subspecies is now known to occur on eight islands in the Gulf of California: Cerralvo, Espíritu Santo, San José, Monserrate, Carmen, Coronado, Ildefonso, and Tiburón. The three examples of this race (SU 14062-64) collected on Cerralvo constitute a new insular record.

The three specimens from Cerralvo are very dark brown; almost black dorsally, with no white flecks or dots. The top of the head is somewhat lighter brown. The supralabials and lateral scales anterior to the eye are of a lighter olive-brown and have suffusions of cream. The infralabials have small patches of white. The dark dorsal coloration extends to the edge of the ventrals, which are cream colored, except in the neck and chin regions which are heavily suffused with the dorsal ground color.

Klauber (1942, p. 93) states that the three specimens from Espíritu Santo are "dark brown to black with light longitudinal dashes. One is as dark as any from Tucson."

Five specimens from Isla San José were available for comparison (SU 14046-48 and CAS 52548-49). The dorsal ground color is yellow. There is a dark gray suffusion on the neck posterior to the parietals, which extends to the 12th-15th ventral and contains 4-5 irregular narrow light bands. The anterior third to half of the body length has dark punctations on the dorsal scale tips (or on their edges) which appear as wavy thin bands. There are gray-black blotchings of no definite pattern on the labials and under the throat. Anteriorly there are four rows of spots on the ventrals. The paired medial rows of these spots are regular and are found on each ventral on the anterior third of the body, fading out posteriorly. The lateral rows of spots are larger and extend farther back, but occasionally skip a ventral.

Five specimens from Monserrate Island were available for study (CAS 52178-52182). The dorsal ground color is dark brown, becoming lighter toward the tail. The side of the head is blotched with cream and the crown is olive-brown. There are numerous yellow markings on the edges of the scales posteriorly. The ventral surface varies from yellow to cream. A very irregular series of brown blotches on the ventrals extends posteri-

only for about half the body length. The neck and chin region are mottled with extensive suffusions of gray brown. CAS 52180, a young specimen, is lighter than the rest and has a more regular pattern.

Klauber (1942, p. 93) states that the one known example from Carmen is "a yellowish specimen with punctated head."

There is but one known example of this race from the tiny island of Ildefonso (CAS 51717). It is colored very similarly to Monserrate examples, except that the ventral surface is very heavily suffused with brown.

Thirteen specimens were collected on Isla Coronados in four hours, on a cloudy day (SU 14049-61). They were seen in the branches of bushes and lying motionless out in the open. These snakes are of the dark color phase. All thirteen are very similar in color pattern, but the young are somewhat the lighter. There is a narrow white edging on some of the lateral dorsal scales. The ventral surface is cream, suffused with large gray spots in the neck and chin region. The spotting changes from large spots anteriorly to scattered flecks posteriorly. SU 14056 is almost as dark as specimens from Cerralvo.

Klauber (1942, p. 93) states that on Tiburón Island both the light and dark phases of the whip snake are found. CAS 53245 from this island is extremely melanistic. There are no light marks on the labials or on the sides of the head and the ventral surface is suffused with dark as far as the anal plate. Even the under surface of the tail is tinged with dark. The dorsal coloration gradually lightens posteriorly and the tail is brown with darker suffusions on part of almost every scale.

In ventral and caudal counts, and in head scales, all insular specimens fall within the limits of variation ascribed to the wide-ranging mainland population. It is interesting to note that on each of the islands (disregarding Carmen and Ildefonso, from each of which we have only one specimen) a particular color phase has become established. Tiburón, a large coastal island, is the only exception. Since intermediates are found stabilized on islands, it seems possible that color is dependent upon stabilization of not only one pair of genes, but also upon one or more pairs of modifying genes as well.

Phyllorhynchus arenicola Savage and Cliff, 1954

This interesting species is endemic to Monserrate Island. It is a member of the *decurtatus* section of the genus, readily distinguished from all other forms of *Phyllorhynchus* by the following combination of characteristics: (1) Dorsal body blotches 30-32 in number, at least twice as wide as light interspaces when measured longitudinally near midbody; at least one-fourth of these blotches partially split by a light medial area. (2) Four to 6 lateral scale rows suffused with brown; this suffusion not extending onto back between dorsal blotches. (3) Lateral spots large, distinct. (4) Ventrals 164 in the male, 172 in the female. (5) Caudals 39 in the male, 31 in the female.

Salvadora hexalepis hexalepis (Cope), 1867

Two specimens of this subspecies are recorded from Tiburón Island. Although the island lies near the proposed line of intergradation between

hexalepis and *deserticola*. Bogert (1945, p. 13, fig. 10) places these two examples as members of the typical subspecies.

Salvadora hexalepis klauberi Bogert, 1945

The first known example of this subspecies to be reported on any Gulf island was collected on San José Island by Jon Lindbergh on April 11, 1952 (SU 14016). It is an adult male with 197 ventrals and 96 caudals. This snake seems referable to *S. b. klauberi* on the basis of the fifth and sixth supralabials reaching the eye, the two loreals, and the ventral and caudal counts.

Our specimen agrees with typical *klauberi* in coloration except that the lower lateral stripe is not regularly present on the fourth scale row anteriorly (well demarcated on third and fourth scale rows in peninsular examples) and the belly is yellow (usually white or only tinged with yellow in peninsula examples).

Mr. Charles M. Bogert has examined the specimen and states (personal communication): "Except for the abnormal, small triangular scale wedged in between the last and penultimate supralabials on each side, and an extra labial below the loreals on the right side, the specimen is a rather typical *S. b. klauberi*. These extra scales in the labial series . . . have no taxonomic importance."

Sonora mosaueri Stickel, 1938

An adult male of this species (SU 14038) was removed from the stomach of a *Masticophis flagellum piceus* collected on the flats of the southwest corner of San José Island. This snake is the first of the genus to be reported from any island in the Gulf of California. The specimen was only slightly digested and it was still possible to ascertain all characteristics necessary for specific placement. The combined ventral and caudal counts exceed by one the previous upper limit of the range of the species. The scale rows are 15-14-13, ventrals 156, and caudals 49.

In addition to the insular example recorded above, one other specimen (SU 14019) of *S. mosaueri* was collected at Bahía San Carlos on the mainland. Bahía San Carlos² is on the Gulf side of the peninsula and lies about 3 miles south of Punta San Telmo at about 25° 30' N. latitude and 111° 1' W. longitude. This snake is an adult male with scale rows 15-14-13, 150 ventrals, and 47 caudals. This species has previously been known only from the vicinity of Comondú, and this example extends the range approximately 100 miles southward.

The coloration in both examples agrees with that given by Stickel (1938, p. 189). The dorsal color is slightly darker brown in the mainland snake and the terminal spots on each scale are less prominent.

The counts on both these examples further support the distinctiveness of *S. mosaueri*, which is separated from all other members of the genus by the number of scale rows (15-14-13), of ventrals (males, 150-156; female, 164), and of caudals (males, 43-49; female, 39), and by the uniform coloration. Additional material may be expected from the mainland as far south as the coast opposite San José Island.

²There is another Bahía San Carlos at about 27° 48' N. latitude.

Micruroides euryxanthus (Kennicott), 1860

A single example of this Arizona and Sonora elapid was recorded by Streets (1877, p. 20) from Tiburón Island. This specimen is now USNM 8566.

Dr. Doris M. Cochran of the National Museum has kindly examined the specimen and has forwarded the information presented here. Ventrals 241, caudals 30, supralabials 7, and infralabials 6. The specimen is very faded and its color pattern now consists of black, white and gray rings. In life, the white rings were yellow and the gray rings were red. The black rings are the widest, the white rings about one quarter as wide, and the gray rings about one-half the width of the black rings.

Crotalus atrox Baird and Girard, 1853

Previous to this report, *C. atrox* was known from only one Gulf island, the coastal island of Tiburón. The specimens from that island, as might be expected, are identical with those from the mainland of Sonora. In addition, one specimen referable to this species and constituting a new insular record was captured on San Pedro Mártir Island (SU 14029) on May 4, 1952, by Dr. Reid Moran.

It is a gravid female having 185 ventrals, 22 caudals, 25 scale rows at midbody, and 5 scale rows between the supraoculars. There are 17-16 infralabials and 14-15 supralabials. The postnasal meets the upper preocular and the prenasal does not contact the supralabial. In coloration, especially in punctations, it is similar to *atrox* in Sonora, except that the posterior dorsal body blotches (the last eight) are extremely faint and only discernable when the specimen is held under water. These dorsal blotches number 34.

In all diagnostic characteristics, the snake seems to fit well within the limits of variation ascribed to *C. atrox* by Klauber (1952, table 1) except in the relationship of the head dimensions to the standard body length. This relationship indicates dwarfing. This specimen has a body length of 830 mm., a head length of 30 mm., and a head width of 22 mm. Following Klauber in his statistical studies on *Crotalus*, we find that for an *atrox* 830 mm. long we should expect a head length of 38 mm. This insular example thus falls well outside the 99 per cent confidence limits for head length as indicated by Klauber (1938, p. 24). If more specimens are collected from San Pedro Mártir Island, this insular *atrox* may well prove to be a dwarfed race.

Crotalus catalinensis, new species

Holotype (SU 15631). (Fig. 3.) Collected on Isla Santa Catalina in the Gulf of California, Mexico, by Bruce Firstman, Dr. John C. Briggs, and the author, on March 27, 1953, as it lay coiled under the shade of a large cactus.

Diagnosis: This species is allied to the *Crotalus atrox* group, but differs from others of that group in being a stunted form, with a distinctive color pattern and oddly-shaped internasals. It can be distinguished from *C. atrox* by the excessively large postcanthal, which extends laterally to separate the preocular from the postnasal, from *C. ruber ruber* and *C. ruber lucasensis* in not having the first infralabials divided transversely, and from *C. tortugensis* both in having the dorsal blotches surrounded by

well defined light scales and in having fewer punctations on the dorsal ground color.

Description of holotype: A sexually mature female. Over-all length 701 mm., length of tail 46 mm., head length 29 mm., head width 22 mm., width of proximal rattle 6.0 mm.

The scale rows number 27–25–21, with 13 rows at the center of the tail and 11 scales bordering the rattle. The ventrals number 182 and the subcaudals 20. The anal is entire. There are 13–15 supralabials and 14–14 infralabials. The second, third, and fourth supralabials are considerably reduced in size, and the fifth is slightly larger than any of the other supralabials. The rostral is very slightly higher than wide. The scales on the crown of the head comprise two irregularly kidney-shaped internasals that are about three times as long as wide. The anterior canthals are small and fit into the concavity of the kidney-shaped internasals. They meet medially and are longer than wide. The posterior canthals (prefrontals) are separated medially by two pairs of small scales and are roughly triangular in shape, being rounded anteriorly at the apex. The supraoculars are the largest of the head scales and are bordered medially by nine small scales posterior to the posterior canthal (pre-frontal). The prenasals are larger than the postnasals, higher than long and in broad contact with the first supralabial on both sides. There is but one loreal on each side, but the posterior canthal extends laterally, preventing contact between postnasal and upper preocular. One small scale separates the postnasal from the supralabials. The upper preocular is the larger; the lower preocular is crescentic. Both preoculars contact with the loreal. Nine scales border the eye, including the supraocular and both preoculars. The triangular mental is longer than wide; the first infralabials are divided; the genials are long and pointed posteriorly. There are neither intergenials nor submentals. The second and third infralabials are noticeably longer, but not wider than the remaining infralabials.

The head is light gray-brown, punctated with brown above, with a faint light streak through the center of the supraoculars. The ocular light stripe extends from the third supralabial (anterior to the commissure) to the anterior edge of the eye and is not sharply defined. The sides of the head are of the same color as the crown, with the exception that the scales posterior to the eye are more heavily punctated with brown.

The dorsal ground color approximates that of the head. The 38 dorsal body blotches are medium brown in their centers and are bordered by a single row of scales of darker brown. These darker scales at the margin of the blotch are bordered by 2 rows of cream-colored scales that separate successive blotches. Both the dark and light scale margins become indistinct on the posterior quarter of the body. Anteriorly the blotches are elongate. In the center of the body, they are of a rounded diamond shape and extend farther laterally. The bordering scales lose their darker hue posteriorly. The blotches are about 7 scale rows wide and 4 scales long in the center of the body. Below the dorsal blotches on either side there is a row of smaller blotches. One of these smaller blotches (slightly the larger) falls below the lateral point of each dorsal blotch, the other between each pair of dorsal blotches. The posterior 9 dorsal blotches coalesce with the larger lateral blotches.

The venter is buff, lightly suffused with gray laterally. The chin and neck region are immaculate. Dorsally, the tail has 5 black rings, which are 4 to 5 scale rows wide medially and taper to a point laterally, except for the posteriormost ring. This is only one and one-half scale rows wide and borders the rattle. The interspaces between the rings are slightly narrower than the dark rings, at least medially; are somewhat darker than the ground color of the body, and are more heavily punctated with brown. The under surface of the tail is darker and more heavily punctated than the venter and in its center has a suffusion of brown-black punctations which forms an indefinite ventral medial stripe. The anterior rattle matrix is black. Only the button is present, no rattles have developed.

Relationship: One would expect this new rattlesnake to be closely related to either *C. ruber ruber* or to *C. ruber lucasensis*, simply because it occurs on Santa Catalina Island which is nearly opposite the intergrading area of these two subspecies on the mainland of Lower California. If color pattern alone were considered, the new snake would appear most closely related to *C. r. lucasensis*. In having the canthal separating the preocular and postnasal, it is typical of *C. ruber ruber*. In having the first infralabial undivided, it is characteristic of neither species. However, it seems likely that this snake is most closely related to *C. ruber*, and has evolved its differences in response to insular isolation.

The ovaries of this specimen were examined by Dr. Malcolm Miller of the Department of Anatomy of Stanford Medical School who reports that the animal did not ovulate this year, but was sexually mature. Since the specimen is only 701 mm. long, this indicates that the animal is dwarfed.

Crotalus enyo cerralvensis, new subspecies

Holotype (SU 14021). (Fig. 4.) Collected on Isla Cerralvo in the Gulf of California on April 3, 1952, by John Figg-Hoblyn, Jay M. Savage, and the author, as it lay coiled in the shade of a bush in the dunes on the southwest coast.

Paratype (CAS 84834). Collected by Dr. G. Dallas Hanna, March 22, 1953. It was buried in a talus slope near the remains of the old Ruffo Ranch on the western coast of Cerralvo Island.

Diagnosis: This subspecies is closely related to, and obviously derived from, the mainland *Crotalus enyo*, from which it can be distinguished in having a higher number of ventral and caudal scales and a proportionately smaller head.

Description of holotype: A mature male, over-all length 765 mm., tail length 72 mm., head length 26.5 mm., head width 17 mm., width of proximal rattle 9.5 mm.

The scale rows are 27-23-19, with 11 rows at the center of the tail; 10 scales border the rattle. The ventrals number 167 and the subcaudals 31; the anal plate is entire. There are 13-13 supralabials and 12-14 infralabials. The fourth supralabial is the only noticeably enlarged labial. The rostral is equal in height and width. The scales on the crown are ridged and knobby and include two rounded triangular-shaped internasals. Posterior to the internasals, a single round canthal meets the

supraocular. The supraoculars are the largest scales on the top of the head. The prenasals are larger than the postnasals, square in form, and contact the first supralabial on either side. There are three loreals on either side. The most dorsal loreal lies caudad to the remaining loreals, which separate the preoculars from the prenasal, but does not interfere with the contact of the canthal with the supraocular. The upper 2 loreals are smaller than the lower loreal. Two small scales on either side separate the postnasal from the first supralabial. The upper preocular is larger than the lower preocular. The lower preocular contacts only the lower loreal, but the upper preocular meets all three loreals. Eight scales border the orbit. The triangular mental is slightly wider than long. The first infralabials are undivided. The 2 genials are touched by 3 infralabials on one side and by four on the other, and converge toward each other to form a point medially. There are neither intergenials nor submentals. All dorsal body scales are keeled except for the rows bordering the ventrals.

The ground color of the head is a heavily punctate gray above. From the first dorsal body blotch arise two brown diverging fingers that extend to the posterior border of the postocular. The posterior half of the supraocular is olive; the anterior half is light gray bordered by a narrow stripe of dark brown. The postocular light stripe extends from the upper corner of the eye, passing above the commissure to fuse with the light ground color below the first body blotch. This stripe is limited above by the finger of the first dorsal blotch and below by the gray-brown color that begins at the angle of the jaws and extends forward to include the upper labials; it continues beneath the eye to the posterior edge of the sensory pit. The preoculars are less punctate and appear to be of approximately the same color as the postocular light stripe.

The body pattern consists of 34 dorsal blotches, of which the first 10 are rectangular with light areas in their centers, and the remainder are rounded diamonds without light centers. A secondary series of black spots appears laterally on each side. The dorsal blotches are outlined in black, and surrounded by a light area about one to two scale rows wide. This light area extends to the lateral apex and diverges around the secondary series of blotches that are opposite the dorsal blotches. The lateral scales enclosed by the light scales are heavily punctated and give the appearance of another lateral series of blotches. Posteriorly, the secondary series of spots merges with the dorsal blotches.

The ventral surface is buff, heavily dotted with gray and brown. The chin and neck region is less spotted. The lower labials are heavily suffused with gray.

The dorsal surface of the tail has six indistinct light brown tail rings. The ventral surface is punctated like that of the venter of the body. The anterior rattle matrix is black; the rattle string is incomplete.

Paratype: The single paratype is a female, over-all length 681 mm., tail length 44 mm., head length 21 mm., head width 16 mm. It has 25 scale rows at midbody, 181 ventrals and 23 subcaudals.

In coloration, it is quite similar to the type, being slightly darker in ground color. Unfortunately, the head was injured in its capture and the

details of head squamation are difficult to ascertain. It does differ from the type in having only 2 loreals.

Comparisons: This island subspecies differs as follows from *Crotalus enyo enyo*:

	Mainland	Cerralvo
Ventrals, males	157-168	167
Ventrals, females	164-177	181
Caudals, males	22-28	31
Caudals, females	18-23	23
Ratio of head to body length	22.5-25.8	28.9-32.5

Crotalus enyo enyo Cope, 1861

This beautiful rattlesnake is known from the following islands in the Gulf of California: Espíritu Santo, including Partida portion; San Francisco, and Carmen.

The Espíritu Santo examples were taken on successive years. SU 14022 is a male and has 23 dorsal scale rows at midbody, 160 ventrals, and 26 caudals. The total length is 751 mm., the head length 28 mm. SU 15630 is also from Espíritu Santo and is a female with 23 dorsal scale rows at midbody, 167 ventrals, and 21 caudals. The total length is 581 mm., the head length 25 mm.

Our single San Francisco Island example (SU 15629) is an immature female only 349 mm. in total length with a head length of 19 mm. It has 23 scale rows at midbody, 166 ventrals, and 21 caudals. There are 13 supra- and 13 infralabials.

Two specimens were collected near a deserted ranch building on Carmen Island. The larger (SU 16532) was collected by the author, under a piece of tin roofing that was exposed to the sun. The heat under the tin roofing was extreme and it was surprising to encounter a rattlesnake there. This specimen, a female, had 23 scale rows at midbody, 173 ventrals, and 22 caudals. The total length is 653 mm., the head length 26 mm. SU 15633, a small immature female, has 25 dorsal scale rows at midbody, 171 ventrals, and 22 caudals. The total length is 338 mm., the head length 18 mm.

Crotalus mitchelli mitchelli Cope, 1861

This subspecies has been noted by Klauber (1936, p. 176) to occur on Cerralvo, Espíritu Santo, and San José islands. He notes that the single specimens examined from San José and Cerralvo are quite typical of *C. m. mitchelli* and that the three examined from Espíritu Santo are somewhat intermediate between the two mainland forms, *C. m. mitchelli* and *Crotalus m. pyrrhus*, but somewhat closer to *mitchelli*.

The author has seen two other examples of this subspecies from Gulf islands. An adult male from San José Island (SU 14030) has 166 ventrals, 27 caudals, 18-17 supralabials, 16-15 infralabials, 36 body blotches and 25 scale rows at midbody.

The other example of this subspecies (SU 14031) constitutes a new record for Carmen Island. It was collected in the vicinity of Puerta Ballendra, April 18, 1953, by John P. Figg-Hoblyn and Jon Lindbergh. It is an adult female which has 175 ventrals, 19 caudals, 16-17 supralabials, 15-14 infralabials, 39 body blotches, and 27 scale rows at midbody.

It is 690 mm. in body length, has a tail length of 44 mm., a head length of 22 mm., and a head width of 28 mm.

Crotalus mitchelli muertensis Klauber, 1949

This dwarfed insular race was recently described by Klauber (1949, p. 97) from 19 specimens. It is endemic to El Muerto Island, which lies near Encantada Grande (wrongly called San Luis on charts) at Lat. 30° N. El Muerto is the fifth of the 6 small islands extending northward from Encantada Grande and seems to be the only island of the Encantada group that is inhabited by rattlesnakes.

This race is closely related to, and undoubtedly derived from, *C. m. pyrrhus* from the adjacent mainland. It differs from *pyrrhus* in its small size (largest specimen only 637 mm.), in having 24 or fewer scale rows at midbody (*pyrrhus* usually has 25 or more), and in having fewer body blotches (32–39, average 35.7).

Crotalus mitchelli pyrrhus (Cope), 1866

Five specimens of this subspecies are known from Angel de la Guarda Island, according to Klauber (1936, p. 176). Head proportions separate *C. m. mitchelli* from *C. m. pyrrhus*, and these specimens are typical of *pyrrhus*. In ventrals, Klauber notes that the insular representatives have slightly higher counts than specimens from the mainland. It is of interest to note that the specimens from Angel de la Guarda are very large, which is very unusual in an island population. This island, however, is one of the largest in the Gulf. Klauber also states that if a large series were available, differences in the ventral counts might be significant enough to warrant subspecific recognition of the insular population.

Crotalus molossus estebanensis Klauber, 1949

The third specimen of the San Esteban rattlesnake (SU 14020) was collected by Jay M. Savage and the author as it was seen escaping toward a talus slope at the mouth of a narrow canyon on the southeastern end of San Esteban Island on May 6, 1952. This subspecies was previously known from only the type specimen (LMK 26792) and a single paratype (USNM 64586).

Klauber (1949, p. 104) differentiates this subspecies from the nearby mainland form on differences in pattern, body proportions, and on a higher number of dorsal blotches.

The Stanford example is an adult male, 890 mm. in body length, with tail length 61 mm., and head length 41 mm. It has six rattles. There are 187 ventrals and 25 caudals. The scale rows are 33–27–21. The scales on the crown consist of two large triangular-shaped internasals which are almost broken to form a pair of canthals, and 2 prefrontals that are wider than long. Three large irregular scales, behind the prefrontals, extend between the supraoculars. The supraoculars are undivided. The other scales on the top of the head are quite small except for a pair of elongate obliquely situated scales, which border the posterior medial surface of the supraoculars and are about the size of 3 of the other scales in that region placed end to end. The rostral is wider than high. The prenasal barely touches the supralabial on one side and is excluded from contact on the other by the small scales anterior to the pit; these scales

number 7 on one side and 8 on the other. On each side, the 2 loreals separate the postnasal from the preoculars. A small scale on each lateral edge of the prefrontals separates the upper preocular from the prefrontal and the supraocular from the upper loreal. The upper preocular is the larger. Including the supraocular and preoculars, 10 scales border the orbit on one side and 9 on the other. A minimum of 3 scale rows separates the orbit from the supralabials. The supralabials number 18-19, the infralabials 16-16. There are no intergenials or submentals and the first infralabial is undivided. Three infralabials contact the genials on each side.

The head has a prominent dark brown patch on the crown in the internasal-prefrontal region. A faint ocular stripe beneath the eye fuses with the lighter supralabials about 3 scales anterior to the commissure. The more posterior ocular stripe is almost obsolete.

The dorsal pattern consists of 39 olive-brown blotches which have no light areas in their centers and are separated dorsally by only one row of light gray scales. The narrow blotches extend laterally to the edge of the ventrals. The light borders of the dorsal blotches divide laterally and form lateral light-ringed circles which are more evident than the dorsal blotches, but become obscured anteriorly and posteriorly as do the dorsal blotches. Neither the circles nor the blotches can be distinguished unless the specimen is held beneath water. The 3 distinct tail rings are brownish-black anteriorly. Posterior to these, the tail is uniform black-brown. Below, the tail is spotted with gray anteriorly, but, posteriorly, changes to the brownish-black of the dorsal surface. The ventral surface of the body is cream, with brown punctations extending laterally.

In life, this rattlesnake appeared to be an iridescent dark green when viewed from a distance. In preservative, it lost this sheen and appears brownish-olive.

The main difference between this specimen and those seen by Klauber is that its crown is darkened, as in mainland *C. molossus molossus*. The best key character to separate the island subspecies from the typical subspecies is, therefore, the higher number of dorsal blotches.

Crotalus molossus molossus Baird and Girard, 1853

A single male example of this subspecies is known from Tiburón Island (MVZ 36490). It was collected by Charles G. Sibley on November 10, 1941.

This is an extremely faded specimen, with the ground color light tan. Due to this fading, it was impossible to count accurately the number of dorsal blotches, even when the specimen was held beneath water. An approximation of the number of blotches was attempted by using the lateral extensions of the dorsal blotch as a guide. This resulted in an estimate of 32-36 blotches. The head is extremely faded, also, and there is no indication of a darkening on the crown.

Ventrals number 184, caudals 25, supralabials 17-16, infralabials 16-16. Dorsal scale formula is 31-26-20.

The tail is dark brown with indications of 6 obscure darker rings. This suffusion of dark brown is extended onto the ventral surface of the tail. The ventrals and chin region are immaculate white.

Crotalus ruber lucasensis Van Denburgh, 1920

The San Lucan rattlesnake is known to occur on only one island in the Gulf of California, San José Island. Two males were collected by members of the first *Orca* expedition (SU 14023–24). Both are large and fully mature and have 192–190 ventrals, 23–22 caudals, 34–32 dorsal blotches, and 27 scale rows at midbody. Each has 2 loreal scales in front of the preoculars. These specimens are not typical of mainland *C. r. lucasensis* and lean somewhat toward *C. r. ruber*, at least in the high number of ventrals and body blotches. In having 2 loreals and 27 scale rows at midbody, however, they are characteristic of *C. r. lucasensis*. In coloration, they are definitely closer to *lucasensis* and on this character I am assigning them to this subspecies. *C. ruber ruber* tends toward red or red-brown, while *lucasensis* is straw-colored, with white scales bordering the blotches in the center of the body. The anteriormost and posteriormost body blotches are poorly defined and can be counted only with difficulty. The tail is light gray with narrow black rings 2 or 3 scales in width. The anterior rattle matrix is black.

Both specimens were collected in the early evening and were quite docile, not bothering to rattle even when approached closely. Klauber has seen 3 additional specimens from this island and assigned them to *C. r. lucasensis*.

Crotalus ruber ruber Cope, 1892

This subspecies is known to occur on the following Gulf islands: Monserrate, San Marcos, San Lorenzo, Angel de la Guarda, and Pond. Klauber has examined specimens from all of these islands, and none differs significantly from mainland representatives of this subspecies.

This rattlesnake was very common on Monserrate, and although only two were collected (SU 14025–26), tracks were very numerous in the dunes and on the floors of rocky canyons. Both specimens were lying in the shade of rocks and even though they were approached within a few feet, they did not coil or rattle.

One specimen was collected on San Marcos (SU 14027) as it lay coiled under a bush.

The two specimens from Monserrate are males. SU 14025 has 192 ventrals, 23 caudals, and 27 scale rows at midbody. It is quite noticeably faded in pattern anteriorly and is more brown than red. SU 14026 has 190 ventrals, 23 caudals, and 27 scale rows at midbody; it is a small specimen and is not faded anteriorly.

SU 14027 from San Marcos has 189 ventrals, 27 scale rows at midbody, and 20 caudals; it is darker than the other 2 specimens.

Crotalus tortugensis Van Denburgh and Slevin, 1921

Crotalus tortugensis is a well-known endemic on Tortuga Island. It is a member of the *atrox* group, and is definitely most closely related to *atrox*, rather than to *ruber* or *exsul*.

As Klauber points out (1930, p. 10), the postnasal-preocular relationship and the head size are the most important characteristics that distinguish *atrox* from *tortugensis*. Of the *atrox* specimens, 94 per cent have contact between the postnasal and preocular, or such contact is prevented by an upper loreal; 3 per cent have such contact prevented by a lower loreal-canthal contact, and 3 per cent are intermediate or borderline cases.

In *tortugensis*, on the other hand, an exactly opposite ratio exists, only 3 per cent have a postnasal-preocular contact; 94 per cent have the contact prevented by a lower loreal-canthal contact; and again, 3 per cent are borderline intermediates. The ratio of the head length to body length is smaller in *tortugensis* than in *atrox* and indicates dwarfing.

Distinctive characteristics: Dorsal coloration is gray and punctated with brown. Dorsal blotches vary from 32 to 40 (averaging 37). They are purplish brown, poorly defined and with light borders only medially. Head markings not well defined. Scale rows 27, occasionally 25; ventrals in males 180–190 (average 184), in females 183–189 (average 186); caudals in males 22–25 (average 24), in females 16–19 (average 18).

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ARTIFICIAL KEY TO THE SNAKES ON THE ISLANDS IN THE
GULF OF CALIFORNIA, MEXICO

- 1a. A rattle or large horny button on tail; a sensory loreal pit between nostril and eye.
- 2a. Prenasals separated from rostral by a row of small scales or granules.
- 3a. Last supralabial twice as long as those before it; head of adult contained in over-all body length more than 24 times.
Crotalus mitchelli mitchelli
- 3b. Last supralabial not conspicuously enlarged; head of adult contained in over-all body length less than 24 times.
- 4a. Scale rows usually 23 or fewer; size small, less than 650 mm.
Crotalus mitchelli muertensis
- 4b. Scale rows usually 25 or more; adults larger than 650 mm.
Crotalus mitchelli pyrrhus
- 2b. Prenasals in contact with the rostral; no granules between rostral and prenasal.
- 5a. Tail with alternating black and ash-gray rings.
- 6a. First infralabial usually divided.
- 7a. A single loreal; scale rows 28 or more; body color red or red-brown. *Crotalus ruber ruber*
- 7b. Two or more loreals; scale rows 27 or fewer; body color yellow, brown, or olive-brown. *Crotalus ruber lucasensis*
- 6b. First infralabial usually not divided.
- 8a. Upper preocular usually not in contact with the postnasal, and no upper loreal present.
- 9a. Light scales surrounding the dorsal blotches; very few punctations on dorsal ground color. *Crotalus catalinensis*
- 9b. Light scales evident only on the mid-dorsal scale rows surrounding blotches; very heavily punctated with darker spots and flecks on dorsal ground color. *Crotalus tortugensis*
- 8b. Upper preocular usually in contact with the postnasal, or such contact prevented by an upper loreal. *Crotalus atrox*
- 5b. No alternating black and ash-gray rings on the tail.
- 10a. Scales on crown knobby with a definite keel in their centers.
- 11a. Head contained in body length less than 26 times.
Crotalus enyo enyo
- 11b. Head contained in body length more than 28 times.
Crotalus enyo cerralvensis
- 10b. Scales on crown flat, though their edges overlap.
- 12a. Body blotches more than 37. *Crotalus molossus estebanensis*
- 12b. Body blotches fewer than 38. *Crotalus molossus molossus*
- 1b. No rattle or button on tail; no pit between nostril and eye.
- 13a. No elongate chin shields between lower labials.
Lichanura roseofusca
- 13b. One or more pairs of elongate chin shields.
- 14a. Internasals fused with nasals; rostral enlarged.
- 15a. Prefrontals in contact medially. *Chilomeniscus cinctus*
- 15b. Prefrontals widely separated medially.
- 16a. Ventrals number 130 or more. *Chilomeniscus savagei*
- 16b. Ventrals number 121 or fewer. *Chilomeniscus punctatissimus*

- 14b. Internasals and nasals present; rostral enlarged or not.
- 17a. Rostral plate with free lateral edges, conspicuously enlarged.
- 18a. A series of body blotches across dorsum; no longitudinal stripes.
 *Phyllorhynchus arenicola*
- 18b. No series of body blotches across dorsum; a pattern of longitudinal stripes.
- 19a. Two supralabials reaching the eye.
 *Salvadora hexalepis klauberi*
- 19b. One supralabial reaching the eye.
 *Salvadora hexalepis hexalepis*
- 17b. Rostral plate not conspicuously enlarged.
- 20a. A pattern of orange, red, and black rings on head, body, and tail.
 *Micruroides euryxanthus*
- 20b. No pattern of rings on body, head or tail; stripes present or not.
- 21a. Scale rows at midbody 23. *Lampropeltis catalinensis*
- 21b. Scale rows at midbody 19 or fewer.
- 22a. Scale rows at midbody 14. *Sonora mosaueri*
- 22b. Scale rows at midbody more than 15.
- 23a. A pattern of small brown blotches on dorsum, with a large blotch or blotches on the nape.
- 24a. Two rows of blotches mid-dorsally, separated by a median stripe a scale or less in width.
 *Hypsiglena torquata venusta*
- 24b. Dorsal row of blotches single; no median light stripe.
- 25a. A narrow median nuchal blotch 1-4 scales wide.
 *Hypsiglena torquata tortugaensis*
- 25b. Median nuchal blotch much wider than 4 scales.
- 26a. Gulars posterior to chin shields enlarged; 43 caudals in the two known females. . . *Hypsiglena torquata gularis*
- 26b. Gulars not enlarged; caudals 42-54 in females
 *Hypsiglena torquata ochrorhyncha*
- 23b. No pattern of blotches on dorsum and no well-defined blotch on the nape or lateral to the nape.
- 27a. No well-defined longitudinal light stripes on body.
 *Masticophis flagellum piceus*
- 27b. Well-defined longitudinal light stripes on lateral body scales.
- 28a. Pattern consisting of one or more dark lateral stripes.
 *Masticophis bilineatus*
- 28b. Pattern consisting of a single light lateral stripe interrupted at intervals of 4-7 scales. . . *Masticophis barbouri*



Fig. 1. Gulf of California, showing principal islands.
Based on Charts No. 620, 621, 1006, U. S. Hydrographic Office.

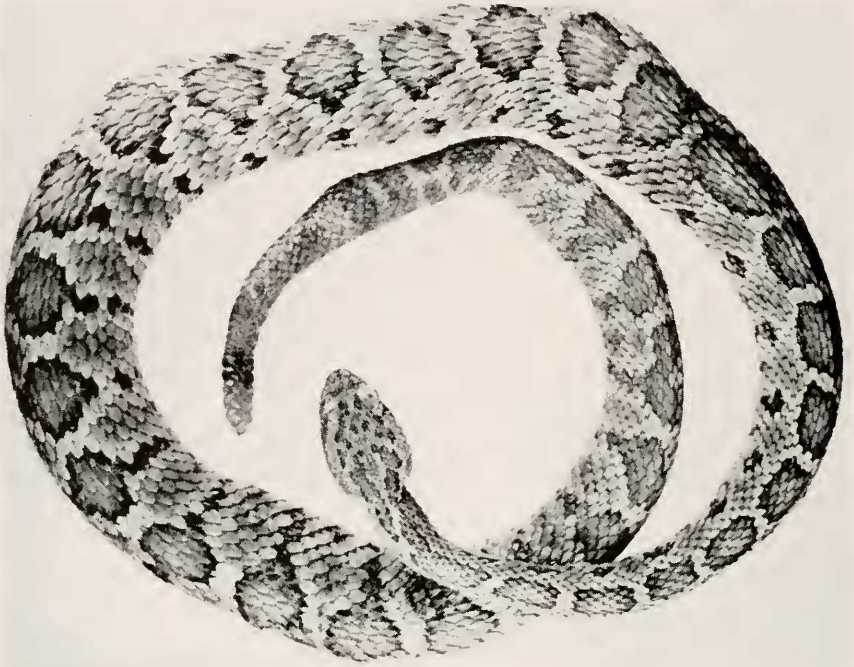


Plate 6, Fig. 3. Photograph of *Crotalus enyo cerraltensis*. Holotype (SU 14021).

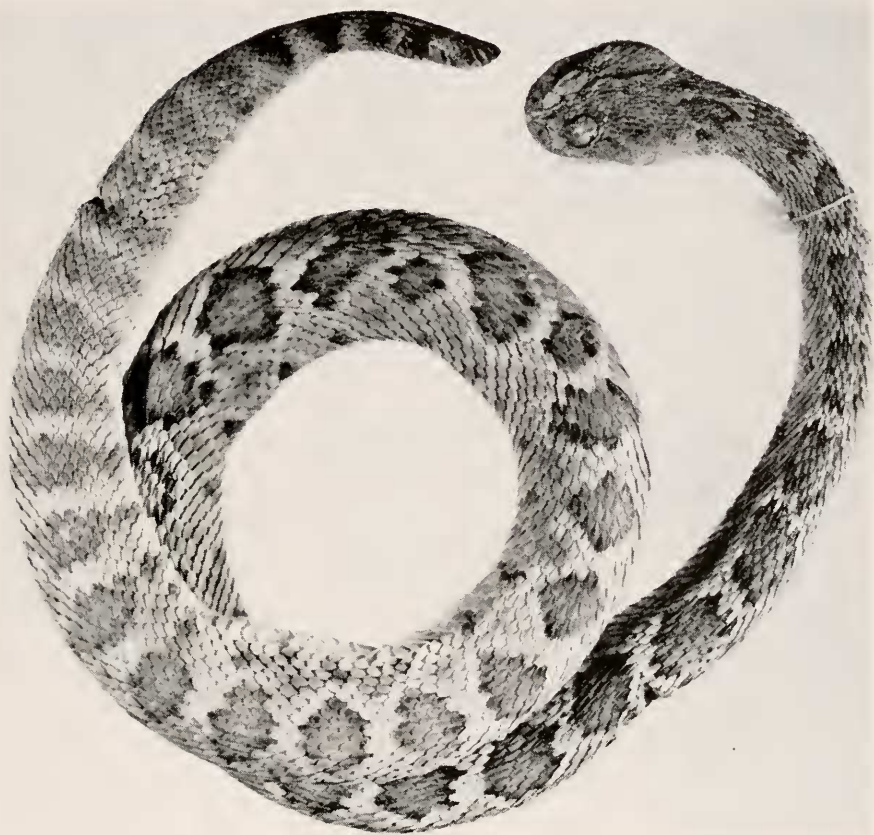


Plate 7, Fig. 4. Photograph of *Crotalus catalinensis*. Holotype (SU 15631.)

